

REMARKS

This Reply is responsive to the Office Action mailed September 23, 2005 and is filed along with a retroactive Petition for a One-Month Extension of Time and authorization to charge the appropriate statutory fee for the extension to Charge Account No. 13-1958.

Favorable reconsideration of this application is requested in view of the foregoing amendments and the following remarks. Claims 1-10 are pending in the application. Claims 1-10 have been amended, and claim 11 is new. No new matter has been added.

112 Rejection

Claim 3 stands rejected under 35 U.S.C. 112 as being indefinite. Applicants have amended claim 3 (and similarly claim 8) to now claim "baffles" instead of "blades" following the Examiner's clarification in this regard.

102 Anticipation Rejection on Iijima

Claims 1, 2, 4, 6, 9 and 10 stand rejected under 35 U.S.C. 102(b) as being anticipated by Iijima (5,364,611)

In response, Applicants have amended claim 1 to clarify that the invention involves flowing a hydrate-forming fluid through a pressurized, temperature controlled, continuous-flow reactor as a continuously flowing fluid. Water is injected into the continuously flowing hydrate-forming fluid as a dispersed fluid at a Reynolds number characterizing the turbulent spraying regime to produce an emulsion of the two fluids, and the emulsion is allowed to flow through the continuous-flow reactor until a consolidated solid-like hydrate/fluid/water stream is formed.

This distinguishes the invention from methods which do not cause turbulent mixing of the two fluids so as to produce an emulsion of the fluids, followed by continuing to flow the emulsion through the apparatus long enough for a consolidated paste-like hydrate/fluid/water stream to form.

In the Office Action, the Examiner states that "no difference is seen as between the CO₂ hydrate of Iijima '611 and the consolidated fluid/water/stream."

Applicants respectfully disagree. Applicants have been careful to point out that their method results in a consolidated solid-like hydrate/fluid/water stream. Applicants' paste-like negatively buoyant consolidated stream of CO₂ hydrate, CO₂ liquid, and water phases is clearly shown in Fig. 3. It is also described in the specification in the description of Fig. 3 on page 6, and in the middle paragraph of page 11 of the specification. Applicants have been unable to find an instance in the cited documents or elsewhere of any other method that produces a similar solid-like consolidated stream of CO₂ hydrate.

Applicants' method as presently claimed in amended claim 1 is very specific with regard to the following :

- i) flowing a hydrate-forming fluid into a pressurized, temperature-controlled continuous-flow reactor (page 7, first full paragraph, lines 2-3);
- ii) flowing water into the hydrate forming fluid at a Reynolds number characterizing the turbulent spraying regime (page 7, first full paragraph, lines 1-8; and page 9, top paragraph, lines 1-12);
- iii) production of an emulsion from the mixing of the two fluids (page 8, first full paragraph, lines 1-10); and
- iv) allowing the emulsion to flow through the reactor until a consolidated solid-like hydrate/fluid/water stream is formed (page 8, top paragraph, lines 2-6; and page 8, first full paragraph, lines 6-10).

The application is also very specific regarding the inventors' belief that they have invented a method for the controlled production of a new hydrate form comprising a hydrate, hydrate-forming species, and water consolidated into a cohesive, solid-like material (page 3, first full paragraph, lines 1-4).

The prior art of Iijima '611 teaches at best the production of only less-consolidated CO₂ hydrate - water forms. Iijima does not employ spraying, turbulent mixing conditions, or particle dispersion as Applicants claim in presently amended claim 1. Iijima does not produce an emulsion, nor flow an emulsion in the reactor long enough for a solid-like hydrate to form. Iijima mentions dispersion, but only in regards to dispersion of the produced CO₂ hydrate over the ocean floor (abstract; col. 2, lines 59-68; col. 6, lines 27-36; and col. 12, lines 1 and 15). For the reasons given above, allowance of presently amended claim 1 is respectfully requested.

Regarding claims 2, 4, 6, 9 and 10, Applicants submit that these claims are dependent on presently amended claim 1, a claim now deemed patentable and, as a result, presently amended claims 2, 4, 6, 9 and 10 now have independently patentable limitations. Accordingly, allowance of amended claims 2, 4, 6, 9 and 10 is respectively requested.

102 Anticipation Rejection on Spencer

Claims 1, 2, 4, 6, 9 and 10 stand rejected under 35 U.S.C. 102(b) as being anticipated by Spencer (5,562,891)

In the Office Action, the Examiner states that "As above, no difference is seen as between the carbon dioxide hydrate of Spencer '891 and the claimed hydrate/fluid/water stream."

All of applicants' above remarks overcoming the 35 U.S.C. 102(b) rejection based on Iijima '611 apply equally to the 35 U.S.C. 102(b) rejection based on Spencer '891.

Spencer '891 teaches at best the production of only less-consolidated CO₂ hydrate - water forms. Spencer does not employ spraying, turbulent mixing conditions, or particle dispersion as applicants claim in presently amended claim 1. Spencer does not produce an emulsion, nor flow an emulsion in the reactor long enough for a solid-like hydrate to form.

Spencer does mention dispersion in two different contexts. The first is in regard to the first stage of his two stage process. In Spencer's first stage, sufficient mixing or agitation is employed to provide for homogeneous dispersion of the flowing CO₂ gas or liquid throughout the flowing water (col. 3, lines 26-33). In this instance, Spencer teaches mixing the two fluids only to the extent of homogeneously dispersing one fluid in the other. Spencer thus teaches a less intense mixing than applicants claim in amended claim 1, and Spencer does not form a hydrate in the first stage of his process.

Spencer also employs dispersion in his second stage. Similar to his first instance, he employs mixing or agitation during the hydrate production step (second stage) that "should be sufficiently vigorous so that the CO₂ is maximally dispersed throughout the hydrate precursor" (col. 4, lines 54-55). Here as well, Spencer teaches mixing the two fluids only to the extent of homogeneously dispersing one fluid in the other. As it was with Iijima, Spencer teaches a less intense mixing than applicants claim in amended claim 1. Spencer does not produce the solid-like hydrate that applicants achieve and claim.

Accordingly, Spencer does not teach or suggest applicants' invention as now claimed. Allowance of presently amended claim 1 is respectfully requested.

Regarding claims 2, 4, 6, 9 and 10, Applicants submit that these claims are dependent on presently amended claim 1, a claim now deemed patentable and, as a result, presently amended claims 2, 4, 6, 9 and 10 now have independently patentable limitations. Accordingly, allowance of amended claims 2, 4, 6, 9 and 10 is respectfully requested.

103 Rejection over Iijima in view of Ohsol
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103 Rejection over Iijima in view of Satek
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103 Rejection over Iijima in view of Allen
103 Rejection over Spencer in view of Allen

Claims 1, 3, 4, 5, 7 and 8 are variously rejected under 35 U.S.C. 103(a) by Iijima '611 and/or Spencer '891 in view of Ohsol '762, Satek '886, and Allen '137.

Applicants submit that these claims are dependent on presently amended claim 1, a claim now deemed patentable and, as a result, presently amended claims 1, 3, 4, 5, 7 and 8 now have independently patentable limitations. Accordingly, allowance of amended claims 1, 3, 4, 5, 7 and 8 is respectively requested.

New Claim 11

New claim 11 has been added to claim that either fluid can be mixed into the other fluid. Claim 11 closely follows the format of claim 1, differing only in interchanging the two fluids. Support for new claim 11 is found at page 8, bottom paragraph, lines 1-3.

In particular, claim 11 claims a method for continuous production of a hydrate-containing material comprising the steps of flowing water through a pressurized, temperature controlled, continuous-flow reactor as a continuously flowing fluid; injecting a hydrate-forming fluid into the water, the hydrate-forming fluid injected as a dispersed fluid at a Reynolds number characterizing the turbulent spraying regime to produce an emulsion of the two fluids; and allowing the emulsion to flow through the continuous-flow reactor until a consolidated solid-like hydrate/fluid/water stream is formed.

New claim 11 is deemed patentable for the same reasons as presently amended claim 1. Claim 11 does not differ appreciably in its method steps as to require a new

search, yet is deemed to be patentably distinct from presently amended claim 1.. Claim 11 does not add any new matter

Applicants believe that all claims are now in condition for allowance. Applicants invite the Examiner to call the undersigned if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance.

Applicants hereby take an Extension of Time for responding to the Office Action mailed September 23, 2005 for a period of one (1) month.

Respectfully submitted,

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